Energy, Mines and Resources Canada | Énergie, Mines et Ressources Canada

CANMET

Canada Centre for Mineral and Energy Technology | Centre canadien de la technologie des minéraux et de l'énergie

A PRELIMINARY PH ANALYSIS OF COAL SLURRIES FROM THE SYDNEY COALFIELD, N.S.

M.J. Campbell, G.R. Corbett, T.R.C. Aston
Cape Breton Coal Research Laboratory

June 1988

This document is an unedited interim report prepared primarily for discussion and information purposes. It does not represent a final expression of the opinion of the Canada Centre for Mineral and Energy Technology (CANMET)

Ce document est un rapport provisoire non révisé et rédigé principalement pour fin de discussion et de documentation interne. Il ne représente nulle part l'opinion définitive du Centre canadien de la technologie des minéraux et de l'énergie (CANMET)

MICROMEDIA

COAL RESEARCH LABORATORIES
DIVISION REPORT CRL 88-41(TR)

88-06055/

A PRELIMINARY PH ANALYSIS OF COAL SLURRIES FROM THE SYDNEY COALFIELD, N.S.

by

M.J. Campbell*, G.R. Corbett** and T.R.C. Aston***

ABSTRACT

In 1988, a study to investigate the feasibility of using strata reinforcement techniques combined with overcoring in situ stress determination methods revealed that although several potential cement and chemical grouts existed, their setting characteristics would be affected by the pH of the host rock.

The report examines the range of pH conditions likely to be encountered in the Harbour, Hub and Phalen Seams of the Sydney Coalfield, N.S.

---

*CO-OP Student, University College of Cape Breton, **Field and Laboratory Technologist and ***Research Scientist, Cape Breton Coal Research Laboratory, CRL, Energy, Mines and Resources Canada, Sydney.

UNE ANALYSE PRÉLIMINAIRE DU PH DES BOUILLIES DE CHARBON PROVENANT DE LA HOUILLÈRE DE SYDNEY, N.-É.

par

M.J. Campbell*, G.R. Corbett** et T.R.C. Aston***

RÉSUMÉ

En 1988, nous avons réalisé un étude portant sur la faisabilité d'utiliser des techniques de consolidation des couches géologiques de pair avec le surcarottage pour la détermination in situ des contraintes. L'étude a permis de constater que bien qu'il existe plusieurs coulis de ciment et de produits chimiques potentiels, les caractéristiques de leur prise en masse sont affectées par le pH de la roche favorable.

Le rapport comprend un exposé sur la gamme de conditions du pH qui existent vraisemblablement dans les gîtes Harbour, Hub et Phalen de la houillère de Sydvey en N.-É.

---

*Étudiant participant à un programme coopératif, University College du Cap-Breton, **Technicien de laboratoire et sur le terrain et ***Chercheur scientifique, Laboratoire de recherche sur le charbon du Cap-Breton, LRC, Énergie, Mines et Ressources Canada, Sydney.

CONTENTS

	Page
ABSTRACT	i
RESUME	iii
INTRODUCTION	1
PROCEDURE	1
DISCUSSION AND CONCLUSIONS	2
REFERENCES	12
APPENDIX A	15

TABLES

No.		
1.	pH readings of Lingan coal slurries (25 g sample/100 ml H_2O)	4
2.	pH readings of Prince coal slurries (25 g sample/100 ml H_2O)	5
3.	pH readings of Phalen coal slurries (25 g sample/100 ml H_2O)	6
4.	pH readings of stonedust slurries (25 g sample/100 ml H_2O)	7

FIGURES

1.	pH analysis of coal fractions (-1/2 +1/4")	8
2.	pH analysis of coal fractions (-1/4 +No. 8)	9
3.	pH analysis of coal fractions (-No. 8 +No. 16)	10
4.	pH analysis of coal fractions (-No. 16 +No. 30)	11
5.	pH analysis of coal fractions (-No. 50 +No. 200)	12
6.	pH analysis of coal fractions (-No. 200)	13
7.	pH analysis of stonedust	14

INTRODUCTION

A variety of overcoring in situ stress determination techniques exist for use in competent strata (CSIRO, CSIR and USBM), although these can seldom be used in weak or incompetent strata. Minifracing techniques can be used in both competent and weak rock, but the strata conditions must not be significantly fractured and/or jointed.

In 1988, the Cape Breton Coal Research Laboratory (CBCRL) completed via a CANMET research contract (1) a study to investigate the feasibility of using strata reinforcement techniques, prior to overcoring, to obtain reliable results in coal and weak coal measures strata. During the course of the study, it was recognised that although a variety of potential cement and chemical grouts exist, their setting characteristics are dependent upon the pH of the host rock. Although it is generally considered that the in situ pH of coal seams should be acidic, a brief review of the subject identified almost no information. This report therefore presents the results obtained from a small scale laboratory experiment undertaken to determine the range of pH conditions likely to be encountered in coal slurries from the Harbour, Hub and Phalen Seams of the Sydney Coalfield, N.S.

PROCEDURE

The experiment consisted of three distinct stages and a list of the equipment used is given in Appendix A.

Stage 1 - Sample Collection

Three samples from CBDC were collected for testing:

Sample No. 1 - Lingan Mine
Sample No. 2 - Prince Mine
Sample No. 3 - Phalen Mine

In each case, the samples were collected either from the coalface or the run of mine coal at surface (where it is outloaded). The samples were

collected as soon as possible after being mined and in such a manner so as to minimise contamination by foreign material.

Stage 2 - Sample Preparation

The coal was allowed to air dry for 24 hours before crushing. After drying, the sample was passed through the jaw crusher to obtain a +1/2" size fraction and then transferred to a mechanical shaker to separate the -1/2" +1/4" fractions.

A representative portion of the -1/4" fraction was then placed on a No. 8 (Tyler) screen in a Ro-Top mechanical shaker for 10 minutes and separated into the following fractions:

-1/4 +No. 8
-No. 8 +No. 16
-No. 16 +No. 30
-No. 50 +No. 200

The various fractions were then bagged and labelled for the Stage 3 procedures.

Stage 3 - pH Determination

For Sample No. 1 - Lingan Mine, 25 g of each fraction was weighed out into a 400 ml beaker containing 100 ml of distilled water. For samples Nos. 2 and 3, the fraction to distilled water ratio was also maintained at 1:4. In addition to the coal, a sample of fresh stonedust was also tested. The sample to distilled water ratio was also maintained at 1:4 (25 g in 100 ml).

The pH meter was standardized before each set of readings (2) and prior to taking each reading, the slurry mixture was stirred using either a magnetic stirrer or stirring rod. Before and after each reading, the pH meter electrode was rinsed with distilled water. During the experiment the slurry containers were covered to minimise atmospheric oxidation of the mixtures.

DISCUSSION AND CONCLUSIONS

Tables 1 to 3 give the results in tabulated format for the Lingan, Prince and Phalen samples, while Table 4 gives the tabulated stonedust results. Figures 1 to 6 present the coal slurry results in graphical format, while Figure 7 presents the results for the stonedust sample.

Examination of Figures 1 to 6 shows a variation in results for all three of the coal slurry samples. The pH for all the size fractions of Prince Mine coal was lower than those of the comparable Lingan and Phalen samples. This is probably due to the higher inherent sulfur content of the Hub Seam coal.

In general, the Lingan and Phalen samples tend to show a pH variation of between 6 and 8, while the Prince samples show variations of between 3 and 6 (-1/2" to +No. 30) and 5 to 7 (-No. 50 to -No. 200). The stonedust sample shows a trend of increasing pH against time with a variation of between 8 and 12 over a period of 350 hours.

REFERENCES

1. Strata Engineering Corporation, "A review and evaluation of strata reinforcement techniques combined with overcoring methods to determine in situ stress regimes in coal and weak coal measures strata"; Prepared under contract for CANMET (DSS File No. 15SQ.23440-7-9151).
2. Fisher Acumet, Model 750 Selective for Analyser, Cat. No. 13-637-750 and 751.

Table 1 - pH readings of Lingan coal slurries
(25 g sample/100 ml H_2O)

CUMULATIVE TIME (HRS)	LINGAN SAMPLE H2O BLANK	VARIOUS FRACTIONS EACH (25 g OF FRACTION MIXED IN 100 ml OF WATER) -1/2 +1/4	-1/4 +No.8	-No.8 +No.16	-No.16 +No.30	-No.30 +No.50	-No.50 +No.200	-No.200
				pH				
0.00	5.81	6.12	6.14	6.44	6.61	6.88	6.97	7.53
1.00	8.81	8.13	7.79	7.18	7.01	7.12	7.38	8.20
1.50	8.76	8.48	7.96	7.59	7.47	7.40	7.62	7.61
19.00	6.25	6.32	6.33	6.47	6.83	7.50	7.85	7.89
21.00	6.35	6.45	6.47	6.71	7.02	7.48	7.92	6.52
23.00	6.41	6.38	6.30	6.59	7.04	7.49	7.87	7.95
25.00	7.34	7.37	6.96	7.12	7.06	7.39	7.88	7.95
43.00	5.24	6.71	6.42	6.69	7.08	7.60	7.82	7.97
45.00	6.77	6.69	6.56	6.77	7.21	7.39	7.74	7.95
47.50	5.71	6.82	6.54	6.74	7.18	7.55	7.98	7.92
50.00	8.61	8.51	8.32	8.22	8.14	7.98	7.84	7.98
67.00	7.28	6.96	6.55	6.87	7.35	7.65	7.73	7.92
69.00	7.73	7.55	7.18	7.22	7.47	7.73	7.86	7.81
71.00	7.16	6.94	6.57	6.88	7.18	7.36	7.63	7.92

Table 2 - pH readings of Prince coal slurries
(25 g sample/100 ml H_2O)

CUMULATIVE TIME (HRS)	PRINCE SAMPLE VARIOUS FRACTIONS EACH (25 g OF FRACTION MIXED IN 100 ml OF WATER)							
	H2O BLANK	-1/2 +1/4	-1/4 +No.8	-No.8 +No.16	-No.16 +No.30	-No.30 +No.50	-No.50 +No.200	-No.200
	pH							
0.00	5.86	5.77	4.89	4.97	4.89	5.03	5.23	6.56
30.00	7.72	5.25	4.72	4.80	4.85	5.14	5.76	7.08
32.50	6.81	5.31	4.78	4.78	4.93	5.78	5.89	7.12
34.50	6.80	5.38	4.75	4.72	4.99	5.19	6.10	7.24
36.00	6.29	5.29	4.74	4.68	4.93	5.20	6.13	7.28
102.00	6.45	4.75	4.51	4.57	4.93	5.39	6.53	7.43
104.00	6.57	4.80	4.49	4.56	4.95	5.51	6.38	7.33
106.00	6.75	4.80	4.49	4.56	4.95	5.51	6.38	7.33
108.00	6.87	6.68	4.62	4.61	5.04	5.58	6.58	7.34
126.50	6.70	6.69	4.44	4.50	4.96	5.63	6.52	7.44
130.00	6.70	6.98	4.44	4.46	4.94	5.56	6.56	7.28
132.00	7.15	6.86	4.38	4.41	4.81	5.49	6.44	7.53
151.00	7.05	6.78	4.41	4.47	4.92	5.72	6.43	7.44
155.00	7.18	6.87	4.37	4.41	4.88	5.75	6.66	7.45
175.00	7.55	6.75	4.39	4.41	4.89	5.73	6.71	7.52
178.00	8.06	6.97	4.39	4.42	4.93	5.86	6.79	7.47
199.00	7.12	6.45	4.28	4.30	4.84	5.71	6.72	7.32
203.50	7.17	6.45	4.33	4.35	5.07	6.02	6.84	7.34
271.00	7.15	4.60	4.14	4.19	4.67	5.61	6.14	6.53
275.00	5.45	3.77	3.06	3.18	3.97	7.55	6.46	6.85
295.00	5.50	3.64	3.02	3.04	3.61	7.10	6.76	6.74

Table 3 - pH readings of Phalen coal slurries
(25 g sample/100 ml H_2O)

CUMULATIVE TIME (HRS)	PHALEN SAMPLE H2O BLANK	-1/2 +1/4	-1/4 +No.8	-No.8 +No.16	-No.16 +No.30	-No.30 +No.50	-No.50 +No.200	-No.200
	VARIOUS FRACTIONS EACH (25 g OF FRACTION MIXED IN 100 ml OF WATER)							
	pH							
0.00	7.20	7.30	7.65	7.91	8.10		7.99	7.54
20.00	5.83	6.56	7.10	7.32	7.49		7.65	7.52
22.00	6.34	6.38	6.97	7.36	7.55		7.72	7.60
24.00	5.74	6.68	7.34	7.66	7.78		7.89	7.62
45.00	6.43	6.64	7.25	7.51	7.66		7.78	7.59
49.50	6.59	6.66	7.47	7.68	7.74		7.75	7.63
69.00	6.39	6.96	7.56	7.94	7.84		7.89	7.47
72.50	6.78	7.12	7.71	7.81	7.70		7.87	7.67
94.00	6.69	6.99	7.70	7.83	7.87		7.86	7.63
97.00	6.03	6.96	7.71	7.83	7.68		7.82	7.62
165.50	6.30	7.03	7.67	7.78	7.88		7.97	7.72

Table 4 - pH readings of stonedust slurries
(25 g sample/100 ml H_2O)

CUMULATIVE TIME (HRS)	STONEDUST 25 g MIXED IN 100 ml OF WATER
	STONEDUST
	pH
0.00	12.21
1.00	12.28
1.50	12.28
19.00	12.09
21.00	12.07
23.00	11.99
25.00	11.92
43.00	11.48
45.00	11.42
47.50	11.30
50.00	11.07
67.00	9.42
69.00	9.28
71.00	9.10
61.00	9.10
91.00	10.74
93.50	8.68
95.50	8.47
97.00	8.58
163.00	8.54
165.00	9.34
167.00	8.28
169.00	8.28
187.50	8.35
191.00	8.16
193.00	8.11
212.00	8.49
216.00	8.19
236.00	8.15
239.00	8.18
260.00	8.23
264.50	8.15
332.00	8.13
336.00	8.11
356.00	7.21

Figure 1 - pH ANALYSIS OF COAL FRACTIONS

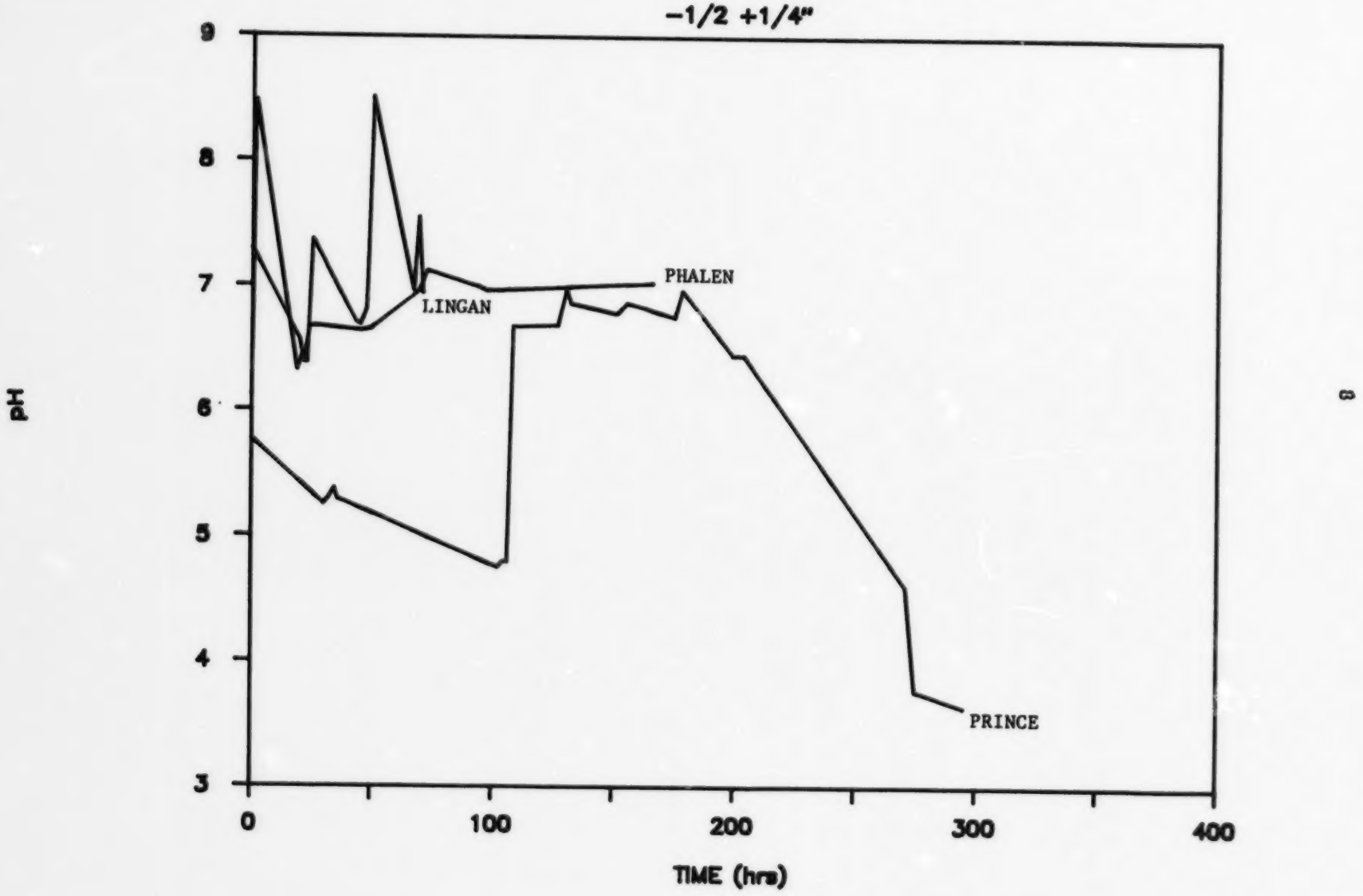


Figure 2 - pH ANALYSIS OF COAL FRACTIONS

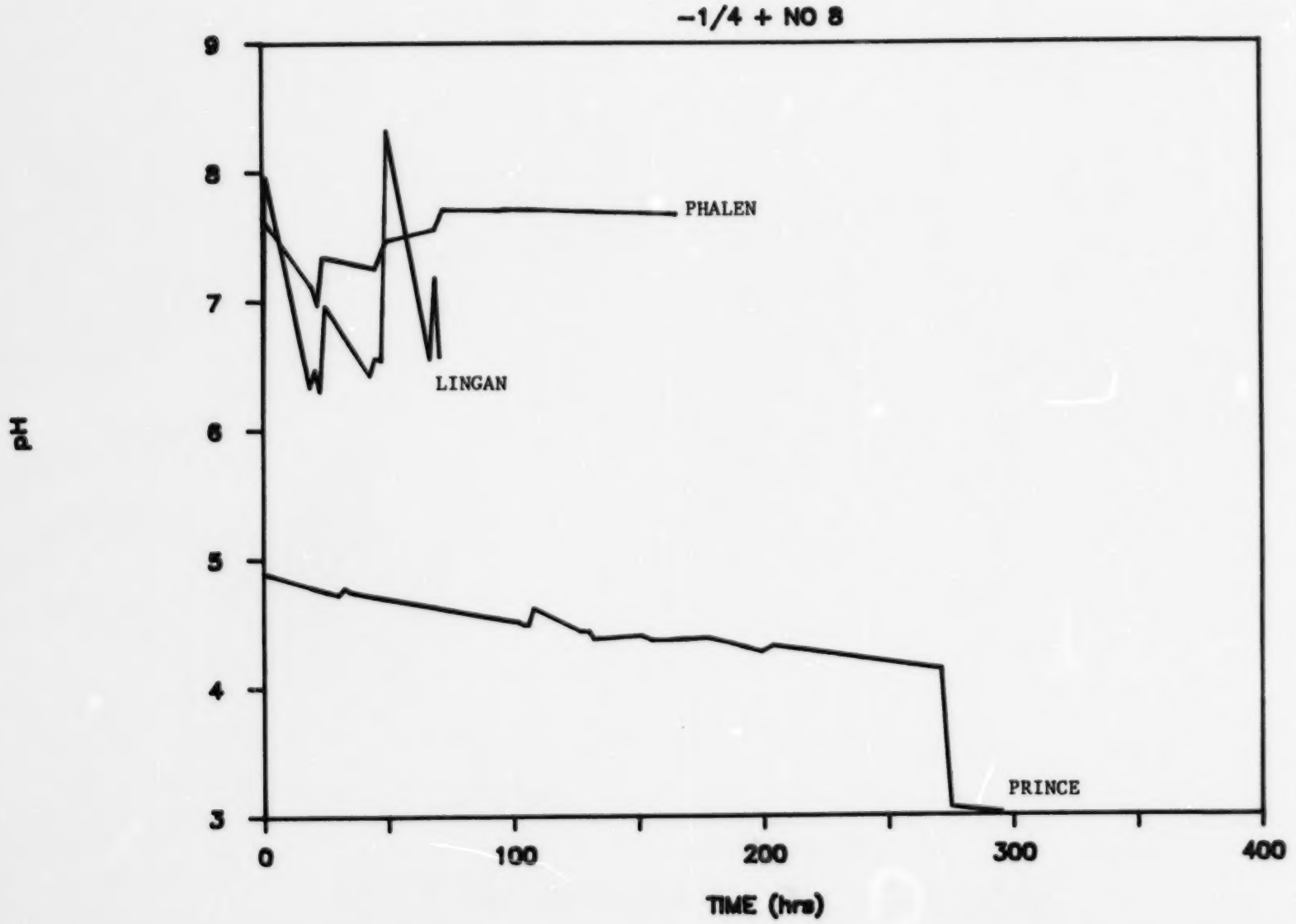
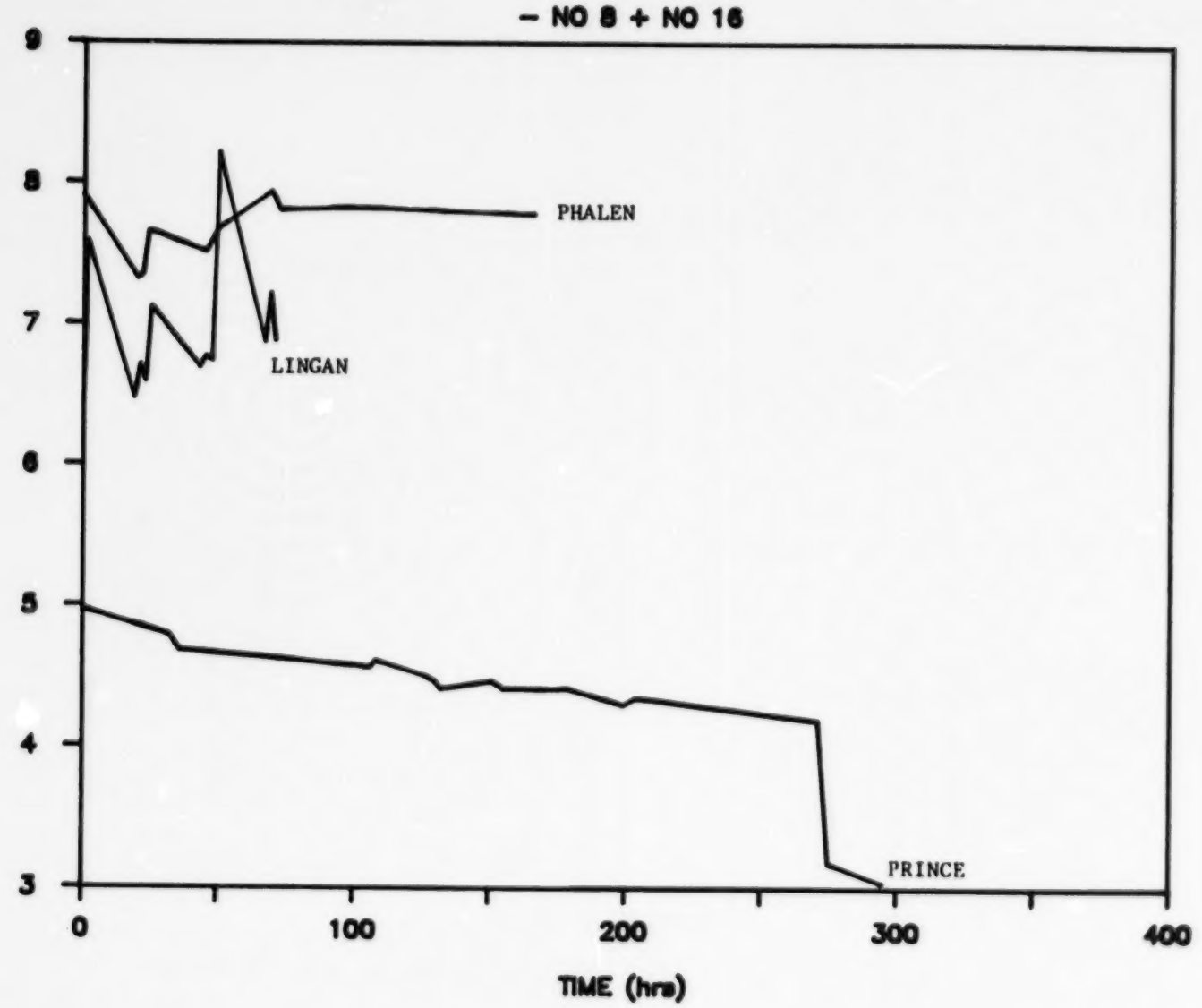


Figure 3 - pH ANALYSIS OF COAL FRACTIONS



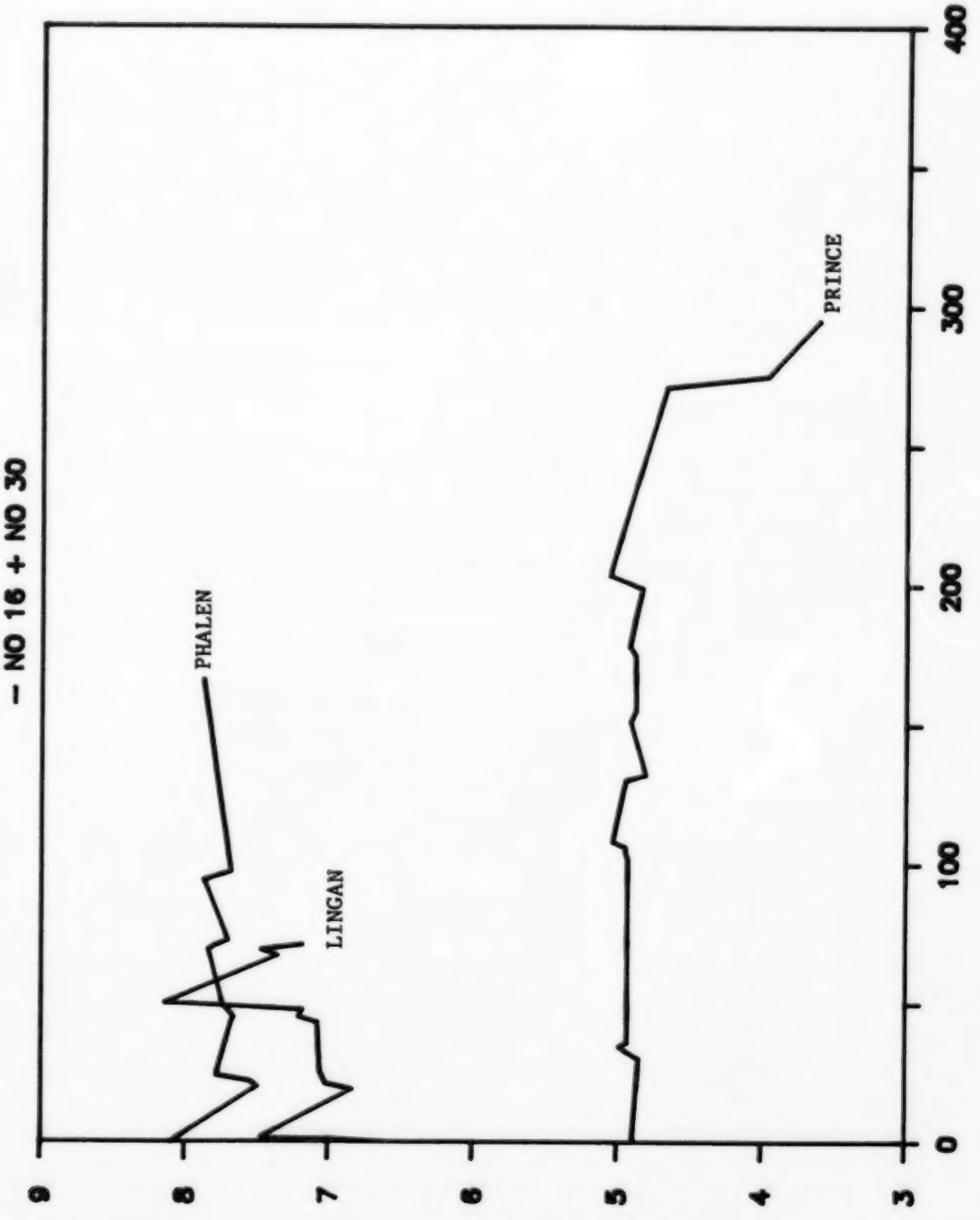

pH ANALYSIS OF COAL FRACTIONS
– NO 16 + NO 30
PHALEN
LINGAN
PRINCE
pH
TIME (hrs)
9
8
7
6
5
4
3
0
100
200
300
400

Figure 4 -

Figure 5 - pH ANALYSIS OF COAL FRACTIONS

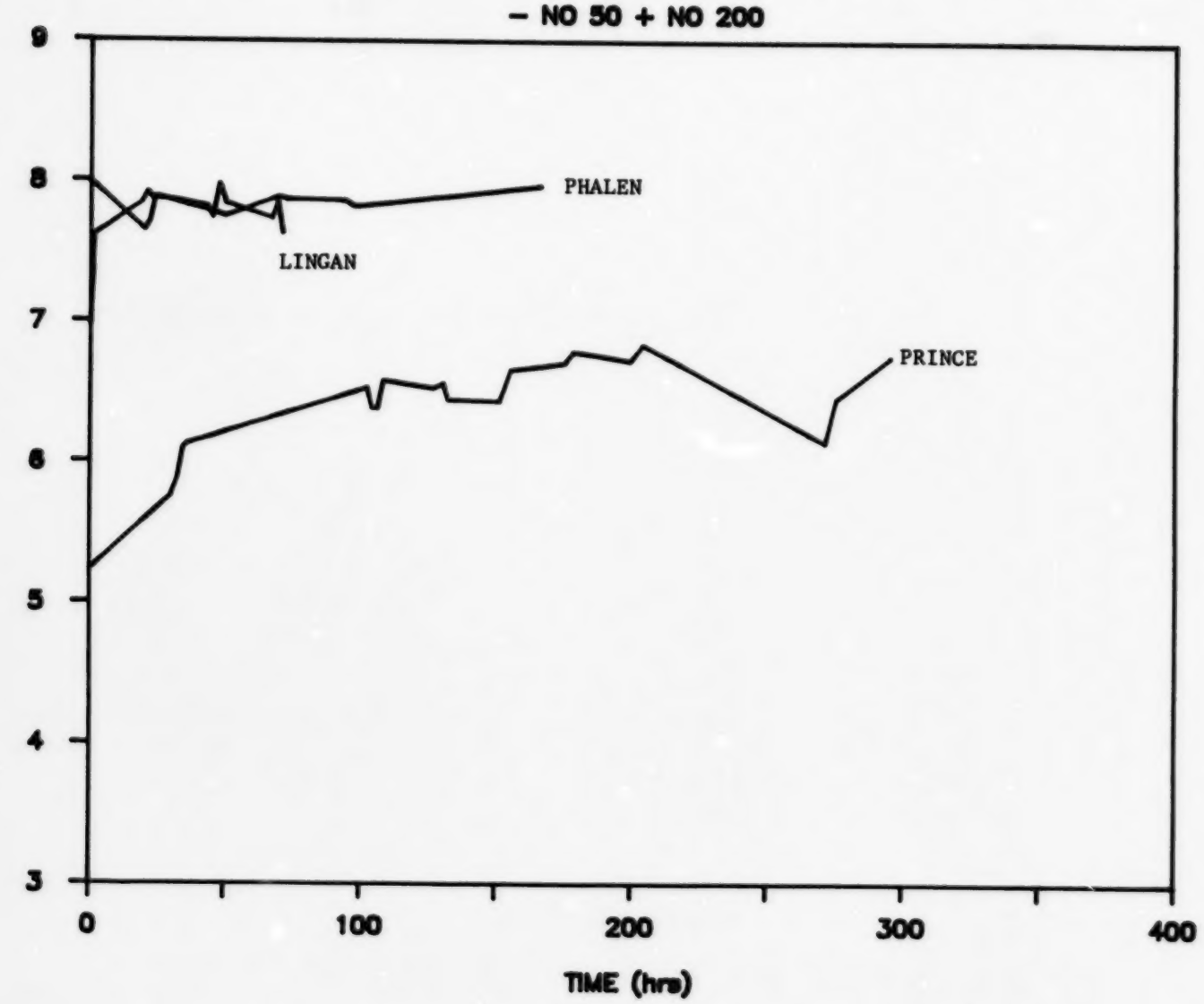
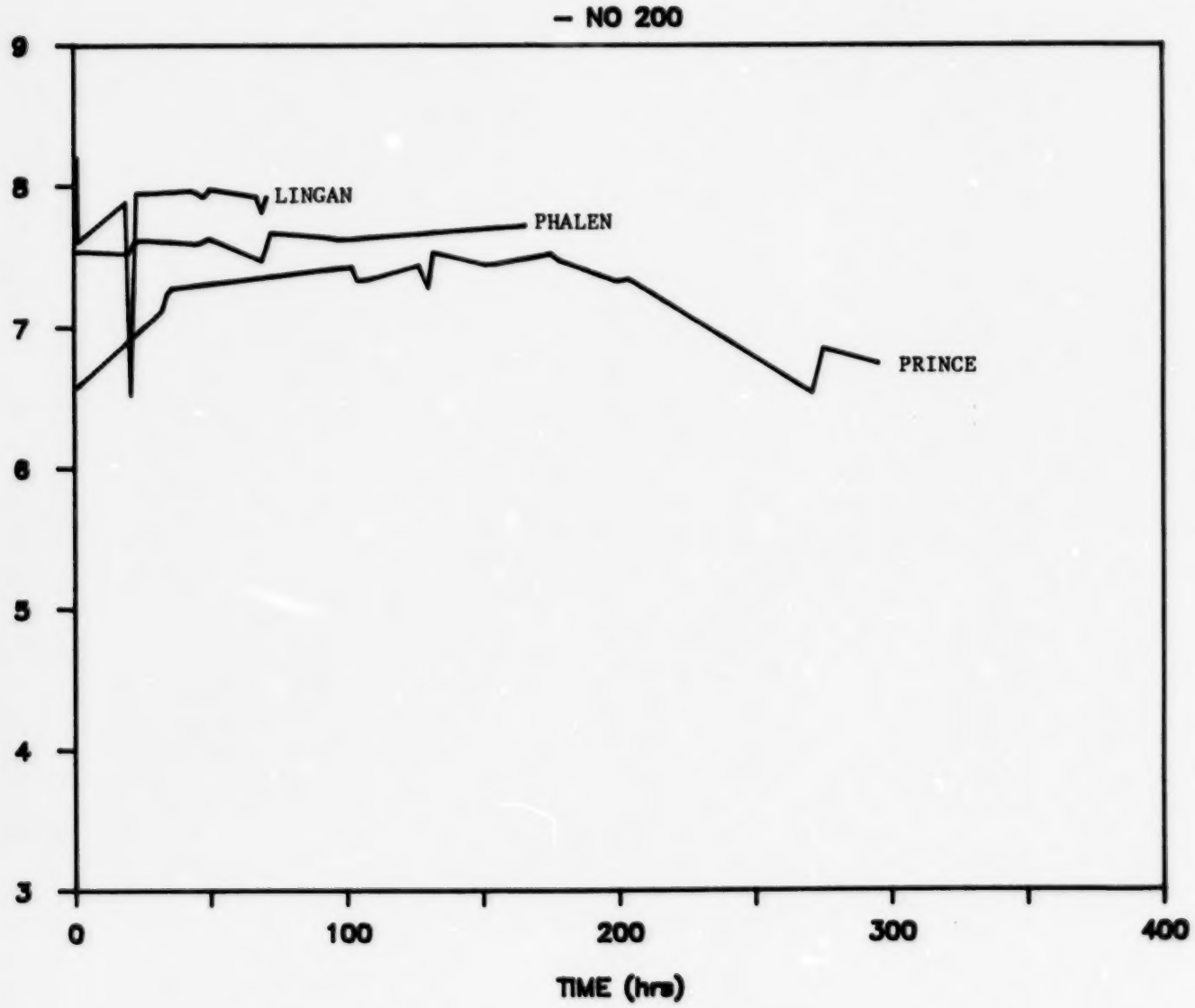


Figure 6 - pH ANALYSIS OF COAL FRACTIONS



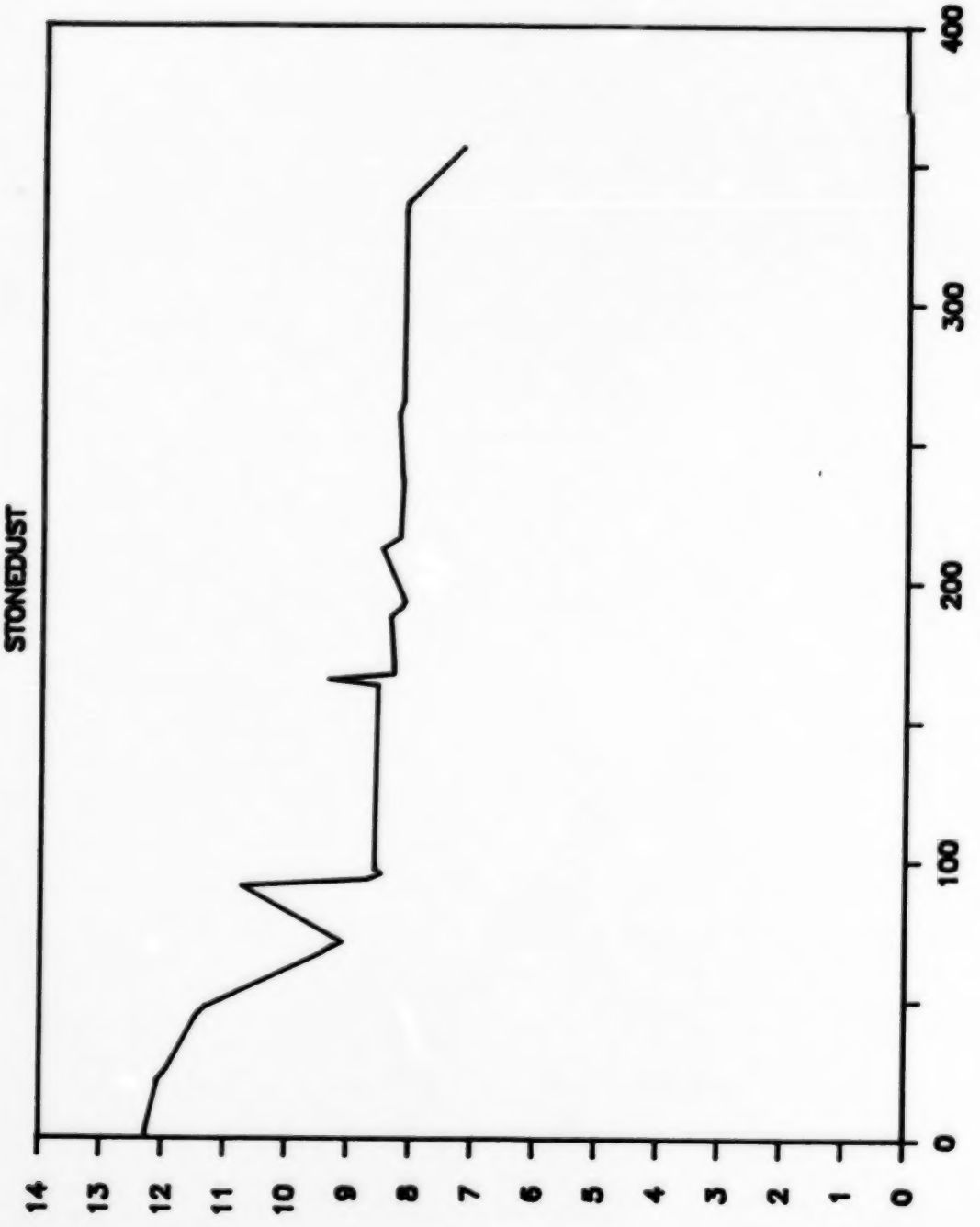


Figure 7 - pH analysis of stonedust

APPENDIX A

EQUIPMENT LIST

3' + 2' Air Dry Pane

Model 4E Straub Grinding Mill

Holmes Pulverizer (-60 screen)

Braun Chipmunk Jaw Crusher

Gilson Testing Screen Shaker

Gilson Testing Screen 1/2"

Gilson Testing Screen 1/4"

Gilson Testing Screen Bottom Pan

WS Tyler Ro-Tap

Canadian and U.S. Standard Sieves

Tyler Equivalent -1/4" +No. 8 (2.36 mm)
-No. 8 +No.16 (1.18 mm)
-No. 16 +No. 30 (5.95 µm)
-No. 30 +No. 50 (300 µm)
-No. 50 +No. 200 (>75 µm)
-No. 200 (<75 µm)

Fisher Accumet Selective Ion Analyzer Model 750

Fisher Standard Combination pH Electrode Ag/AgCl

Orion Standard Combination pH Electrode

12 Glass Beakers (400 ml)

Fisher Certified Buffer Pack 4,7,10 pH

Mettler PC 2000 Pan Balance

Corning PC-351 Hot Plate Stirrer

Various Sampling Pans, Brushes, Plastic Bags and Tags